

THE LECTURER: Toby Riley is a C-E-I-R, INC., senior consultant in program development who has more than ten years experience in the field of computer sciences. He has served as project director for such large-scale programs as Du Pont's RAMPS



(8,500 FORTAN statements) and the NASA Launch Vehicle Model. Riley is a member of ACM and the British Computer Society, and has been guest lecturer in computer sciences at the London School of Economics, the Regent Street Polytechnic and Woolwich Polytechnic Institute. In addition, he has conducted programming courses for more than 200 scientists and 50 professional programmers for NASA. He is currently conducting similar courses for the FAA and the USDA Graduate School. During his experience with both IBM and C-E-I-R, Riley has programmed on all the IBM 1400 and 7000 series computers, as well as several systems in the UNIVAC Scientific series, and Burroughs, GE, and RCA computers. Riley received his undergraduate degree from Swarthmore and has completed two years of graduate studies at the Case Institute of Technology.



INSTITUTE FOR ADVANCED TECHNOLOGY

REGISTRATION: Tuition, including noon meals and all course materials, is \$195 for the first student and \$175 for each additional student from the same organization. Classes begin each day at 9 a.m. and continue through 5 p.m. Hotel rooms are not included.

HOTEL ACCOMMODATIONS: The seminar will be given at the Statler Hilton Hotel, 16th and K Streets, N.W., Washington, D. C. The Statler Hilton will hold a block of rooms for advance reservation by students through October 15, eleven days prior to the seminar.

OTHER COURSES: The Institute for Advanced Technology program covers many subjects in the field of data processing and the management sciences. Among the seminars currently scheduled are:

COMPUTER OPERATIONS MANAGEMENT: A service-oriented approach to efficient center management. Washington, D. C., October 19-21.

TIME-SHARING SOFTWARE: Examines multi-programming in continuous processing operating systems. New York, N. Y., October 26-28.

For an outline of these or other courses in the IAT program, write:

Registrar
Institute for Advanced Technology
C-E-I-R, INC.
1200 Jefferson Davis Highway
Arlington, Virginia 22202
Phone: Area Code 703/684-6377

Computer Program Documentation and Debugging

Washington, D. C.
October 26, 27, 28

A three-day seminar for working programmers and programming managers designed to review current practice and suggest standards for effective operations. Two days and one evening session are spent on documentation. This section covers problems, methods, and standards, the impact of common languages, formal systems, and needs of differing installations. A visit to a Washington area installation is included, as well as a workshop session in which student programs are processed by automatic documentation systems. The one-day session on debugging covers planning and estimating debugging time, methods, types of errors, standards, and effects of the program environment.

C-E-I-R^{INC}

Institute for Advanced Technology
1200 Jefferson Davis Highway
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COMPUTER PROGRAM DOCUMENTATION & DEBUGGING COURSE OUTLINE

FIRST DAY

DOCUMENTATION

Definition of a Computer Program

Identification of needs and requirements of programmers, operators and management.

Standards for Documentation

What is to be documented, setting measures for evaluating documentation, recommended guides.

Problems of Documentation

Maintaining currency, divisibility, control, and simplicity; effect of environment.

Types of Documentation

Review of the various types and their applications.

Automated Documentation

Discussion and explanation of the Flowcharter, Symbolic Block Diagram System, and reordering programs. Problem exercise.

Evening Workshop Session

"Hands-on" computer processing of student documentation exercise at C-E-I-R Computer Center.

SECOND DAY

Impact of Common Languages

Documenting features of such common programming languages as COBOL and ALGOL.

Formal Systems

Documentation procedures and standards used by several large-scale organizations.

The Programming Environment

Evaluation of typical documenta-

tion systems in relation to size and objectives of the particular installation;

Field trip to a local installation to examine documentation concepts and procedures.

THIRD DAY

PROGRAM DEBUGGING

The Full Task of Program Testing

Defining when a program is debugged; the completed program; planning and estimating test time.

Methods and Techniques

Types of Errors

Errors in coding and control; in program analysis; in mathematical analysis, and in obsolescence.

Standards and Performance Evaluation

Critical analysis of performance versus estimation.

Effects of Program Environment

Applications, pressures, attitudes, etc.

PROGRAM PLANNING

Extending Program Life

Maintenance, flexibility, hardware conversion.

Factors in Program Planning and Design Which Affect the Documentation and Debugging Problems

Selection of coding language, program segmentation, order of computation, etc.

SUMMARY AND CONCLUSION

Open discussion, questions and answers.

C-E-I-R^{INC.} is an international applied research and data processing corporation that offers analytical, scientific and computer services to business, science and government. Founded in 1954, it is today the world's largest, most experienced and best equipped independent organization in its field. The C-E-I-R professional staff includes several hundred mathematicians, statisticians, economists, operations researchers, management scientists and others from a variety of disciplines. In addition, many of the finest scientific and professional men in America are retained on a consultant basis. Augmenting this professional capability are modern electronic computing equipment, and skilled computer programmers and operations personnel at computing centers in five major U.S. cities, London, The Hague and Mexico City.



is the latest expression of C-E-I-R's long-standing involvement in management education. The revolutionary nature of computer-based methods made education an integral part of C-E-I-R operations from the beginning. This relationship is formalized through the Institute for Advanced Technology. IAT faculty members are drawn primarily from the ranks of C-E-I-R's professional and computer operations staffs. Its curriculum is drawn from subjects in which C-E-I-R staff members are expert—recognized for excellence in day-to-day application of the art and science of computer usage to the real problems of C-E-I-R customers in business and industry. Sharing these new skills through seminars in major cities, management clinics, and special, in-plant training programs is the major goal of the Institute for Advanced Technology.

BUSINESS REPLY MAIL

NO POSTAGE NECESSARY IF MAILED IN THE UNITED STATES

FIRST CLASS
PERMIT NO. 35700
WASHINGTON, D. C.

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Institute for Advanced Technology
C-E-I-R, Inc,**

**1200 Jefferson Davis Highway,
Arlington, Virginia**

[illegible]

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Registration and course materials: \$195.

Statler Hilton Hotel
Washington, D. C.
October 26, 27, 28

Register me for: DOCUMENTATION & DEBUGGING

NAME:

TITLE:

COMPANY:

ADDRESS:

Please Register This Additional Student:

NAME:

TITLE:

CHECK ENCLOSED ☐

Bill My Company ☐

INSTITUTE FOR ADVANCED TECHNOLOGY

1200 JEFFERSON DAVIS HIGHWAY • ARLINGTON, VIRGINIA 22202 • (703) 684-6377

DOCUMENTATION AND
DEBUGGING -- BASICS OF
EFFECTIVE PROGRAMMING

Dear Sir:

You may want to argue with Toby Riley during his presentation of the Computer Program Documentation & Debugging seminar. As a matter of fact, we hope you will, because the ground he covers involves two controversial aspects of programming that are not often approached in terms of objective standards.

Riley has some firm beliefs about documentation and debugging acquired over a ten-year career in programming and programmer management. Working for a company that built its reputation largely in development of computer software on a contract basis, Riley's beliefs are, frankly, colored by the need to deliver computer programs on time, to specifications, and within a budget.

If you have seen programming money slurrp down the drain because of inadequate (or over-adequate) documentation, or through debugging that cost too much man time and machine time, you may have considered such possible causes as:

- Informal or non-existant training in two basic programming skills--documentation and debugging.
- The absence of practical standards for defining and managing the documentation and debugging tasks.

That's what this seminar is concerned with. Designed for both the programmer and the programming manager, it covers documentation and debugging from A to Z at a practical, working level. In each area it first defines the subject, then reviews current practices, and winds up with an outline for workable performance standards.

You may have concluded at this point that Riley figures he knows it all. He doesn't. And the conclusions reached in this seminar won't necessarily be his own--he expects you to come prepared to argue the point whenever you think he's off the track. The idea is to open up discussion and lead it to a consensus acceptable to the entire group.

We said that a good part of C-E-I-R's reputation is built on its performance in computer software development. And that Riley, in his years with IBM and C-E-I-R has developed a healthy appreciation and understanding of the importance of documentation and debugging.

An example of what we mean is C-E-I-R's development of a resource allocation model (under the lecturer's direction) with the E. I. du Pont de Nemours & Company. This program consists of more than 8,500 FORTRAN statements, and was under development for two years. Throughout this period, programmers, mathematicians, and engineers were kept in constant communication regarding development of algorithms, practicality of the approach, and data processing problems. The program was subjected to in-house testing, then on-site field testing in several different client locations, each with different conditions.

-2-

In every instance, the documentation had to be complete for each of the different staffs involved during the year the program underwent field tests. This documentation included program lists, explanation of algorithms, test correspondence, training texts and user's guides. Tasks such as this one helped C-E-I-R (and Riley) appreciate the problems of programming for multi-installation use, and meeting a variety of specifications for a common program.

During this seminar you will be asked to consider the problem of meaningful problem definition, and answer the question of what to document, and when to document it, and why.

Each participant is asked to bring along two computer programs: one that you believe to represent most features of a well-documented program, and a second program that you will use in a class exercise.

In the class problem you will see your second program processed by two automatic documentation systems, [Flowcharter and the Symbolic Block Diagram System], both run on the 7090 at C-E-I-R's computing center. You will discuss and evaluate the results of these systems, and consider other special documenting routines that can be written or used by programmers.

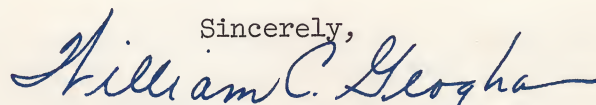
The sessions on documentation will be supplemented by a visit to a local computer installation to study its implementation of documentation procedures.

This seminar will benefit any practicing programmer or programmer manager by focusing his attention on important aspects of his job whose proper handling can:

- Extend program life by simplifying the job of making changes and conversions.
- Improve manager-programmer communication by setting ground rules for objectives, methods and status reporting.
- Facilitate the exchange of information between programmers and thereby better coordinate the group effort.
- Reduce the amount of man and machine time spent in program debugging.
- Increase the efficiency -- and reduce the cost -- of the programming operation.

This seminar will be given October 26, 27 and 28 at the Statler-Hilton Hotel in Washington, D.C. These are three days that can help you advance your professional career. Circle them on your calendar now, and mail the enclosed registration form. We look forward to meeting you.

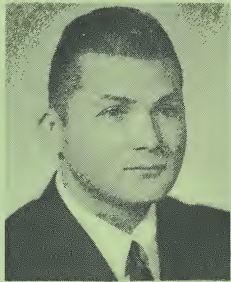
Sincerely,



William C. Geoghan
Curriculum Director

INSTRUCTORS

HOWARD BROMBERG



Howard Bromberg is a C-E-I-R, INC., senior staff consultant whose many activities in data processing include membership on the AFIPS Board of Directors, service with the CODASYL Systems

Group, chairmanship of the ASA working group on COBOL standards, and membership on the ASA Subcommittee on Standardization of Common Programming Languages.

ALLEN J. TRIVIGINO

Allen J. Trivigino is a C-E-I-R, INC., regional manager of business data processing systems with an extensive background in computer programming for commercial applications, including production planning and control, automatic product distribution and replenishment, large scale file maintenance, and sales analysis.

WALTER E. SIMONSON

Walter E. Simonson is a C-E-I-R, INC., senior staff scientist and corporate representative on the SHARE PL/1 Committee. Current assignments include systems analysis, operations research, and information retrieval. At Burroughs Corporation he worked on hardware and software evaluation as well as business data processing applications.



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OTHER COURSES: The Institute for Advanced Technology program covers many subjects in the field of data processing and the management sciences. Among the seminars currently scheduled are:

PROGRAMMING LANGUAGES: West Coast presentation. San Diego, Calif., December 6-7-8.

BUSINESS FORECASTING: An introduction to scientific forecasting techniques and their business applications. New York, N.Y., Nov. 30 - Dec. 1-2.

TIME-SHARING SOFTWARE: Examines multi-programming for continuous processing. Washington, D. C., Dec. 7-8-9.

For an outline of these or other courses in the IAT program, write:

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1200 Jefferson Davis Highway
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Telephone: Area Code 703/684-6377

PROGRAMMING LANGUAGES

(With the Emphasis
on PL/1 & COBOL)

A three-day seminar
Washington, D. C., Nov. 16-18
Statler-Hilton Hotel

This seminar is intended for those intimately involved in the selection and use of computer languages. It provides an overview of the major programming languages and their advantages and disadvantages with detailed presentations of the System 360 programming language (PL/1) and of COBOL. The PL/1 section covers the general organization of the language. The COBOL section is an introductory presentation in which the latest CODASYL publication is used to indicate the language's scope, advantages and disadvantages. Tuition, including luncheons and all course materials, is \$175 for one student and \$155 for each added student from the same organization.

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COURSE OUTLINE

GENERAL SECTION

Introduction to Programming Languages

- General Structure
- Types and categories

Use of Programming Languages

- Manufacturer use
- Customer applications

Evaluation of Programming Languages

- Criteria for judgment
- Advantages and disadvantages

Activity in Programming Languages

- ASA-BEMA-ACM-CODASYL

Future of Programming Languages

COBOL SECTION

Four Major Divisions of the COBOL Language

- Identification—labeling the program author, installation, date and purpose
- Environment—configuration and input/output sections
- Data—file section; working storage section; constant section
- Procedure—actions to be performed by the program; its structure

Program Verbs

- Input/output verbs
- Data manipulation verbs
- Arithmetic verbs
- Sequence control verbs

Processor Verbs

- ENTER
- EXIT
- NOTE

COBOL Extensions

- Mass Storage
- Table Handling
- Sort
- Report Writer
- Segmentation

COBOL Class Exercise

- Student-coded subroutine compiled on C-E-I-R, INC. IBM 7090.

NPL SECTION

Introduction to the New Programming Language

Statement Elements and the Assignment Statement

- Character set
- Elementary entities
- Data types
- Contexts
- Scalar expressions
- Evaluation of expressions
- Assignment statement
- Functions and procedures

Program Structure and Control Statements

- Program format
- Program structure
- Procedure definition
- Control statements
- Allocate and Free statements
- Replace and Include statements

Name Description

- Declare statement
- Dimension declaration
- Data type attribute
- Structures
- Variable length and picture attributes
- Abnormal attribute
- Procedure name attributes
- Implicit attributes
- Implicit statement

Input/Output

- Save and Restore statements
- Files, records groups and sentences
- Data transmission
- Data lists
- Detailed format specifications
- Preparations for file activity
- General formatting
- The Seek statement
- The selection procedure
- File description

Summary Section

- General Question Period
- Evaluation of Compilers
- Survey of Use
- Available Publications

C-E-I-R^{INC} is an international applied research and data processing corporation that offers analytical, scientific and computer services to business, science and government. Founded in 1954, it is today the world's largest, most experienced and best equipped independent organization in its field. The C-E-I-R professional staff includes several hundred mathematicians, statisticians, economists, operations researchers, management scientists and others from a variety of disciplines. In addition, many of the finest scientific and professional men in America are retained on a consultant basis. Augmenting this professional capability are modern electronic computing equipment, and skilled computer programmers and operations personnel at computing centers in five major U.S. cities, London, The Hague and Mexico City.



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C-E-I-R SEMINAR COVERSSYSTEM 360 LANGUAGE,CURRENT COBOL PRACTICE

Dear Sir:

If your job involves use and selection of computer languages, the Programming Languages seminar will help you achieve the informed view you need to make these important decisions.

This seminar, presented in Washington, D. C., November 16-17-18, covers compilers, assemblers, interpreters and translators. The subject matter is organized in a meaningful framework to examine their applications and their advantages and disadvantages.

The principal instructor is Howard Bromberg, a member of the programming profession whose experience includes service on national and international committees dealing with programming languages and their standardization.

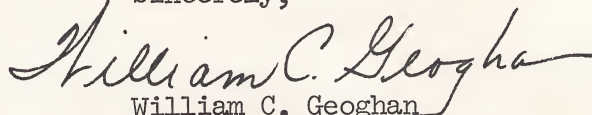
The language field in general is covered first, and then attention is focused in greater detail on two languages of major importance for today and for the future -- COBOL and PL/1. Included in the COBOL section is a class problem which you will code in COBOL and see the result after it is compiled on an IBM 7090 at C-E-I-R's computing center.

PL/1 is considered from the viewpoint of the language organization, its implementation, and its likely effect on computer programming in the future.

Your participation in this seminar will bring you up to date on current developments and practices in computer language application, and, in addition, help you to a clearer understanding of the re-programming problem raised by PL/1.

We hope that you or a member of your organization will mail the enclosed registration card and take part in this helpful analysis of computer programming languages and their application.

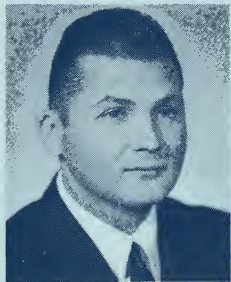
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LIST PROCESSING & STRUCTURED DATA: Washington, D. C., February 1-3.

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Mayflower Hotel
Washington, D. C.
January 18-19-20

Register me for: PROGRAMMING LANGUAGES ☐

NAME: _____

TITLE: _____

COMPANY: _____

ADDRESS: _____

PHONE: _____

Please Register This Additional Student:

NAME: _____

TITLE: _____

CHECK ENCLOSED ☐

BILL MY COMPANY ☐

BUSINESS REPLY MAIL

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